

National Climatic Data Center

DATA DOCUMENTATION

FOR

DATASET 3635 (DSI-3635)

GOES I-M East

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National Climatic Data Center
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1. Abstract: This dataset contains products derived from GOES (Geostationary Operational Environmental Satellites) which provide the kind of continuous monitoring necessary for intensive data analysis. They circle the Earth in a geosynchronous orbit, which means they orbit the equatorial plane of the Earth at a speed matching the Earth's rotation. This allows them to hover continuously over one position on the surface. The geosynchronous plane is about 35,800 km (22,300 miles) above the Earth, high enough to allow the satellites a full-disc view of the Earth. Because they stay above a fixed spot on the surface, they provide a constant vigil for atmospheric "triggers" for severe weather conditions such as tornadoes, flash floods, hail storms, and hurricanes. When these conditions develop the GOES satellites monitor storms and track their movements. GOES satellite imagery is also used to estimate rainfall during the thunderstorms and hurricanes for flash flood warnings, as well as estimates snowfall accumulations and overall extent of snow cover. Such data help meteorologists issue winter storm warnings and spring snow melt advisories. Satellite sensors also detect ice fields and map the movements of sea and lake ice.

The GOES system produces a large number of primary **data products**. They include:

- Basic day/night cloud imagery and low-level cloud and fog imagery.
- Upper and lower tropospheric water vapor imagery.
- Observations of land surface temperature data with strong diurnal variation.
- Sea surface temperature data.
- Winds from cloud motions at several levels and hourly cloud-top heights and amounts.
- Albedo and infrared radiation flux to space, important for climate monitoring and climate model validation.
- Detection and monitoring of forest fires resulting from natural causes and/or manmade causes and monitoring of smoke plumes.
- Precipitation estimates.
- Total column ozone concentration (potential data product).
- Relatively accurate estimates of total outgoing longwave radiation flux (potential data product).

Over the past 30 years, environmental service agencies have stated a need for continuous, dependable, timely, and high- quality observations of the Earth and its environment. The new generation Geostationary Operational Environmental Satellites (GOES I through M) provide half-hourly observations to fill the need. The instruments on board the satellites measure Earth-emitted and reflected radiation from which atmospheric temperature, winds, moisture, and cloud cover can be derived.

The GOES I-M series of satellites is owned and operated by the National Oceanic and Atmospheric Administration (NOAA). The National Aeronautics and Space Administration (NASA) manages the design, development, and launch of the spacecraft. Once the satellite is launched and checked out, NOAA assumes responsibility for the command and control, data receipt, and product

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generation and distribution.

Each satellite in the series carries two major instruments: an Imager and a Sounder. These instruments resolve visible and infrared data, as well as temperature and moisture profiles of the atmosphere. They continuously transmit these data to ground terminals where the data are processed for rebroadcast to primary weather services both in the United States and around the world, including the global research community.

The GOES I-M mission is scheduled to run from the mid-1990s into the first decade of the 21st century. Each element of the mission has been designed to meet all in-orbit performance requirements for at least five years.

The GOES I-M system performs the following basic functions:

- Acquisition, processing, and dissemination of imaging and sounding data.
- Acquisition and dissemination of Space Environment Monitor (SEM) data.
- Reception and relay of data from ground-based Data Collection Platforms (DCPs) that are situated in carefully selected urban and remote areas to the NOAA Command and Data Acquisition (CDA) station.
- Continuous relay of Weather Facsimile (WEFAX) and other data to users, independent of all other functions.
- Relay of distress signals from people, aircraft, or marine vessels the search and rescue ground stations of the Search and Rescue Satellite Aided Tracking (SARSAT) system.

GOES provides the instantaneous relay functions for the **SARSAT system**. A dedicated search and rescue transponder on board GOES is designed to detect emergency distress signals originating from Earth-based sources. These unique identification signals are normally combined with signals received by a low-Earth-orbiting satellite system and relayed to a search and rescue ground terminal. The combined data are used to perform effective search and rescue operations.

The GOES I-M system serves a region covering the central and eastern Pacific Ocean; North, Central, and South America; and the central and western Atlantic Ocean. Pacific coverage includes Hawaii and the Gulf of Alaska. This is accomplished by two satellites, GOES West located at 135 west longitude and GOES East at 75 west longitude. A common ground station, the CDA station located at Wallops, Virginia, supports the interface to both satellites. The NOAA Satellite Operations Control Center (SOCC), in Suitland, Maryland, provides spacecraft scheduling, health and safety monitoring, and engineering analyses.

Data Product Usage: These data products enable users to accurately monitor severe storms, determine winds from cloud motion, and when combined with data from conventional meteorological sensors, produce improved short-term weather forecasts. The major operational use of 1 km resolution visible and 4 km resolution infrared multi-spectral imagery is to provide early warnings of threatening weather. Forecasting the location of probable severe convective storms and the landfall position of tropical cyclones and hurricanes is heavily dependent upon GOES infrared and visible pictures. The quantitative temperature and moisture and wind measurements are useful for isolating areas of potential storm development.

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Major Users: GOES I-M data products are used by a wide variety of both operational and research centers. The NWS's extensive use of multi-spectral imagery provides early warnings of threatening weather and is central to its weather monitoring and short-term forecast function. Most nations in the Western Hemisphere depend on GOES imagery for their routine weather forecast functions as well as other regional applications. GOES data products are also used by commercial weather users, universities, the Department of Defense, and the global research community, particularly the International Satellite Cloud Climatology Project, through which the world's cloud cover is monitored for the purpose of detecting change in the Earth's climate. Users of GOES data products are also found in the air and ground traffic control, ship navigation, agriculture, and space services sectors.

The GOES Imager is a multi-channel instrument designed to sense radiant and solar-reflected energy from sampled areas of the Earth. The multi-element spectral channels simultaneously sweep east-west and west-east along a north-to-south path by means of a two-axis mirror scan system. The instrument can produce full-Earth disc images, sector images that contain the edges of the Earth, and various sizes of area scans completely enclosed within the Earth scene using a new flexible scan system. Scan selection permits rapid continuous viewing of local areas for monitoring of mesoscale (regional) phenomena and accurate wind determination.

The GOES Sounder is a 19-channel discrete-filter radiometer covering the spectral range from the visible channel wavelengths to 15 microns. It is designed to provide data from which atmospheric temperature and moisture profiles, surface and cloud-top temperatures, and ozone distribution can be deduced by mathematical analysis. It operates independently of and simultaneously with the Imager, using a similarly flexible scan system. The Sounder's multi-element detector array assemblies simultaneously sample four separate fields or atmospheric columns. A rotating filter wheel, which brings spectral filters into the optical path of the detector array, provides the infrared channel definition.

More information can be found here:

<http://www.oso.noaa.gov/goes/index.htm>

<http://goes.gsfc.nasa.gov/text/goestechnotes.html>

<http://cimss.ssec.wisc.edu/goes/realtime/grtmain.html>

2. Element Names and Definitions:

This product is derived from DSI-3701 which contains raw GOES Satellite data in the GVAS and GVAR formats. Data can be provided in either digital or analog form, and in a variety of formats. Digital data may be obtained through ftp or on any number of digital media. Analog data may be obtained in various photographic formats such as GIF or JPEG.

Complete documentation on the GVAR Format can be found here:

<http://goes.gsfc.nasa.gov/text/GVARRDL98.pdf>

3. Start Date: 19950201

4. Stop Date: Present

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5. **Coverage:**

- a. Southernmost Latitude: 70.0S
- b. Northernmost Latitude: 70.0N
- c. Westernmost Longitude: 150.0W
- d. Easternmost Longitude: 0.0E

6. **How to Order Data:**

Ask NCDC's Climate Services about the cost of obtaining this data set.

Phone: 828-271-4800

FAX: 828-271-4876

E-mail: NCDC.Orders@noaa.gov

7. **Archiving Data Center:**

Archive Branch
National Climatic Data Center
151 Patton Avenue
Asheville, NC 28801

8. **Technical Contact:**

National Climatic Data Center
151 Patton Avenue
Asheville, NC 28801

9. **Known Uncorrected Problems:** None.

10. **Quality Statement:**

11. **Essential Companion Datasets:**

12. **References:**

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